1.) $F(x,y,z) = \langle 8e^x \sin y, 8e^y \sin z, 9e^z \sin x \rangle$

a.) $\nabla f \times \vec{F}$ $\begin{vmatrix} \frac{\partial f}{\partial x} & \frac{\partial f}{\partial y} & \frac{\partial f}{\partial z} \\ 8e^x \sin y & 8e^y \sin z & 9e^z \sin x \end{vmatrix}$ $\langle a_2b_3 - a_3b_2, a_3b_1 - a_1b_3, a_1b_2 - a_2b_1 \rangle$

$\langle \frac{\partial f}{\partial y}(9e^z \sin x) - \frac{\partial f}{\partial z}(8e^y \sin z), \frac{\partial f}{\partial z}(8e^x \sin y) - \frac{\partial f}{\partial x}(9e^z \sin x), \frac{\partial f}{\partial x}(8e^y \sin y) - \frac{\partial f}{\partial y}(8e^y \sin z) \rangle$

$\langle 0 - 8e^y \cos z, 0 - 9e^z \cos x, 0 - 8e^y \sin z \rangle$

$\langle -8e^y \cos z, -9e^z \cos x, -8e^y \sin z \rangle$

$-8e^y \cos z\,\hat{i} - 9e^z \cos x\,\hat{j} - 8e^y \sin z$

b.) $\nabla f \cdot F$

$\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \rangle \cdot \langle 8e^x \sin y, 8e^y \sin z, 9e^z \sin x \rangle$

$\frac{\partial f}{\partial x}(8e^x \sin y) + \frac{\partial f}{\partial y}(8e^y \sin z) + \frac{\partial f}{\partial z}(9e^z \sin x) \rangle$

$8e^x \sin y + 8e^y \sin z + 9e^z \sin x$

6.) $F(x,y,z) = 5y^2z^3\,\hat{i} + 10xyz^3\,\hat{j} + 15xy^2z^2\,\hat{k}$

$f_x = 5y^2z^3$
$f_y = 10xyz^3$
$f_z = 15x^2y^2z^2$

$5xy^2z^3 + h(y,z)$
$10xyz^3 + h_y(y,z) = 10xyz^3$
$h_y(y,z) = 0$
$g(z)$

$5xy^2z^3 + g(z)$
$15xy^2z^2 + g'(z) = 15xy^2z^2$
$g'(z) = 0$
$6 = K$

$5xy^2z^3 + K$

7.) $F(x,y,z) = xyz^2\,\hat{i} + x^6yz^2\,\hat{k} + x^6y^2z\,\hat{k}$

$\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \rangle$
$\langle yz^2, x^6z^2, x^6y^2 \rangle$

$\langle \frac{\partial f}{\partial y}(x^2y^2) - \frac{\partial f}{\partial z}(x^6z^2), \frac{\partial f}{\partial z}(yz^2) - \frac{\partial f}{\partial x}(x^6y^2), \frac{\partial f}{\partial x}(x^6z^2) - \frac{\partial f}{\partial y}(yz^2) \rangle$

$\langle 2x^2y - 2x^6z, 2yz - 6x^5y^2, 6x^5z^2 - z^2 \rangle$

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11.) $r = x\,\hat{i} + y\,\hat{j} + z\,\hat{k}$ $\quad r = |r|$

a.) $\langle \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial f}{\partial z} \rangle \cdot \langle x, y, z \rangle$ $\quad \frac{\partial f}{\partial x}(x) + \frac{\partial f}{\partial y}(y) + \frac{\partial f}{\partial z}(z)$

$|r|\,|r| = 3$ $\quad |r|\,|r| = 3$

13.) $\langle 0,0,\omega k\rangle \times \langle x,y,z\rangle$

$\langle 0(z)-\omega(y),\ \omega(x)-0(z),\ 0(x)-0(y)\rangle$

$\langle -\omega(y),\ \omega(x),\ 0\rangle$

$-\omega y\hat{i}+\omega x\hat{j}$

$\left\langle \frac{\partial F}{\partial x},\frac{\partial F}{\partial y},\frac{\partial F}{\partial z}\right\rangle \times \langle -\omega_y,\omega_x,0\rangle$

$\left\langle \frac{\partial F}{\partial y}(0)-\frac{\partial F}{\partial z}(\omega_x),\ \frac{\partial F}{\partial z}(-\omega_y)-\frac{\partial F}{\partial x}(0),\ \frac{\partial F}{\partial x}(\omega_x)-\frac{\partial F}{\partial y}(-\omega_y)\right\rangle$

$\langle 0,0,\ \omega+\omega\rangle$

$\langle 0,0,2\omega\rangle$

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